



# Water quality

## Ground Water-

Water found below the surface where holes, cracks and spaces between rocks and soil are filled with water.

## Surface Water-

Natural and artificial accumulations of water on the land surface.

## Indiana's Most Harmful Water Pollutants

- Pathogens such as *E. coli*
- Oxygen-depleting nutrients such as fertilizers, untreated sewage and manure
- Chemical contaminants such as polychlorinated biphenyls, pesticides and metals
- Siltation from soil erosion

## WATER POLLUTION

Water sustains life, supports commerce and agriculture and provides recreation and enjoyment. We depend on surface and ground water for our drinking water. Indiana's beaches, rivers and lakes are popular destinations for recreation. Industry and commerce rely on Indiana's plentiful water supply to make steel, electricity and many other products.

Every time it rains or the snow melts, water carries pollutants from the air and land into surface and ground water. Some pollutants break down in the environment, but others persist and accumulate in fish, shellfish and other aquatic organisms or become trapped in river and lake sediments for many years.

Water pollution sources are classified as point or nonpoint sources. Point sources of pollution have a known discharge point, such as a pipe or sewer. An example of a point source discharger is an industrial wastewater treatment plant that discharges treated water directly into a stream. Here are some examples of typical point sources: municipal sewage treatment; combined sewer overflows; industrial wastewater; and electrical power plants.

Nonpoint source pollution refers to water pollution which runs off the land that results from things such as soil erosion, agriculture, urban runoff, land development and air pollution deposits. Nonpoint pollution sources are often challenging to identify, measure and control. Here are some examples of typical nonpoint sources: agricultural activities; urban stormwater runoff; resource extraction; construction activities; and land disposal (landfills and land application of sewage sludge).



# INDIANA’S IMPAIRED RIVERS AND LAKES

The map on the right shows Indiana’s impaired rivers and lakes. In accordance with the Surface Water Quality Monitoring Strategy, IDEM performs sampling, analysis and assessment of each basin once every five years. The impaired rivers and lakes, in red, do not meet Indiana’s water quality standards for designated uses or other natural resource goals, such as aquatic life support, fish consumption and recreational use.

## INDIANA’S RIVERS AND STREAMS

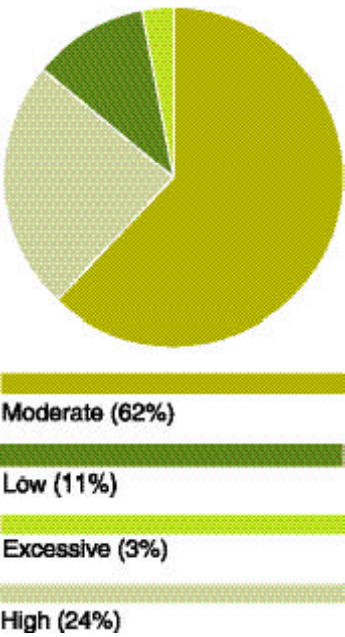
As of 2000, IDEM has assessed more than 50 percent of the state’s total stream miles for the water’s ability to support fish, shellfish and other aquatic life. Seventy-six percent of those stream miles were found to be supportive of aquatic life. Of the 23 percent of stream miles surveyed for recreational use, more than one-third were determined unsafe for swimming due to frequent high levels of *E. coli* bacteria.

## INDIANA LAKES

IDEM monitors the nutrient enrichment (or eutrophication) levels of Indiana’s public lakes and reservoirs. Eutrophication is a natural aging process of lakes, which can be adversely increased by man’s activities in and around the lake. Physical, chemical and biological data gathered on each lake are combined into a multi-metric index, scored from 0 to 75 points, and classified according to nutrient levels and effects. The lower the score, the lower the levels and effects of nutrients.

### Nutrient Levels in Public Lakes and Reservoirs

Source: IDEM Office of Water Management, 2000



### Indiana’s Impaired Rivers and Lakes

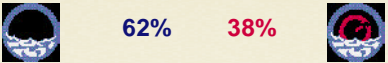
Source: 2000 Indiana Water Quality Report



#### Aquatic life support (50% assessed)

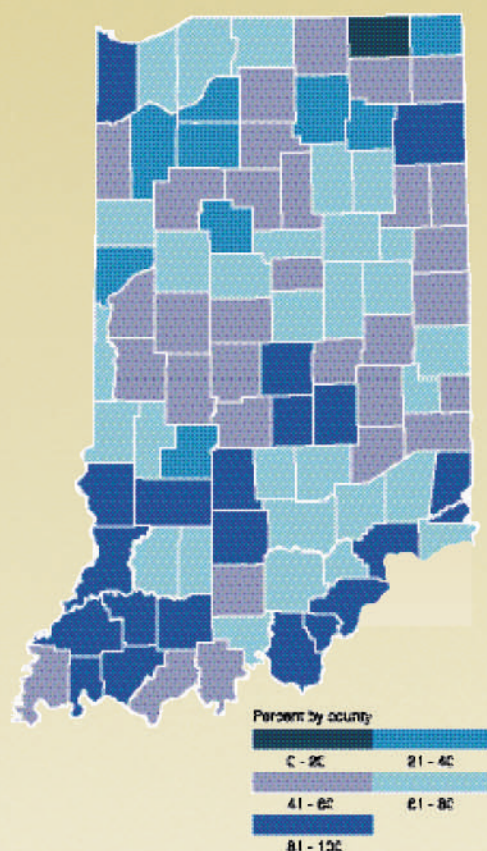


#### Recreational uses (23% assessed)



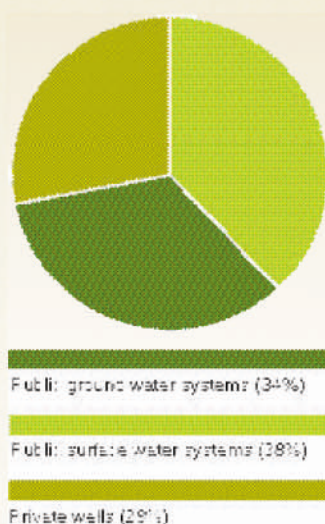
## Households Served by Public Drinking Water Supply Systems

Source: IDEM Office of Water Management, 1999



## Sources of Drinking Water for Indiana Households

Source: IDEM Office of Water Management, 1999



## DRINKING WATER

Seventy-two percent of Hoosiers get their drinking water from community public water supply systems. As might be expected, Hoosiers living in urban areas are more likely to use public drinking water than those in rural areas who are more likely to use private wells.

## PUBLIC DRINKING WATER SYSTEMS IN INDIANA

Indiana has more than 4,000 active public water supply systems. These range from large community systems serving urban areas to small non-community water systems serving seasonal campgrounds. More than 1,500 public drinking water systems serve residential and commercial customers year-round.

Indiana's public water systems obtain their water from ground water sources via wells or surface water sources such as lakes, rivers or reservoirs. Thirty-four percent of Indiana households obtain their water from public water systems that utilize ground water. Public water systems utilizing surface water serve an additional 38 percent of Hoosiers. Twenty-eight percent of Indiana households rely on private wells for drinking water.



### Public Water Systems

Public water systems are classified according to the number of people they serve, the source of their water (surface or ground water) and whether they serve the same customers year-round or on an occasional basis.

**Community Water Systems** — Public water systems that supply water to the same population year-round.

**Non-Community Water Systems** — Non-transient, non-community public water systems regularly supply water to at least 25 of the same people at least six months per year, but not year-round. Some examples are schools, factories, office buildings and churches that have their own water systems. Transient non-community public water systems provide water in a place such as a gas station or campground where people do not remain for long periods of time.



## THREATS TO DRINKING WATER

Contaminants can enter drinking water supplies from point sources or from nonpoint sources. These contaminants can move from the land into ground water or into lakes and streams. Community public water suppliers must properly treat and disinfect water, which may contain bacteria and nitrates. These contaminants pose the most immediate health risks.

## VIOLATIONS OF DRINKING WATER STANDARDS

U.S. EPA has established drinking water health standards for 77 contaminants. If a public water system exceeds a standard, fails to properly treat the water or does not test according to schedule, the water supplier must notify its customers of the violation and work to correct the problem.

In 2000, 91 percent of community public water systems met all drinking water health standards for the 77 contaminants. Total coliform bacteria was the most common contaminant found in the noncompliant systems. Seventy-seven percent of the systems that violated drinking water standards in 2000 violated the total coliform bacteria standard.

In addition to drinking water health standards violations, U.S. EPA and IDEM evaluate all public water systems based on compliance with all drinking water regulations, including monitoring and reporting requirements. Systems with multiple health or paperwork violations may be classified as being in significant noncompliance. The Indiana population served by systems in significant noncompliance has dropped 97 percent since 1994, to less than 13,500 people in 1999. In 2000, the population served by systems in significant noncompliance has increased to 36,475 due to increased reporting requirements.

### Consumer Confidence Reports

In 1999, community water systems were required to send their first Consumer Confidence Report to each customer. These reports provide information to consumers about the characteristics of their water system and quality of water provided at the tap including any violation the system incurred during the previous year. In 1995, 95 percent of community water systems complied with this new requirement. In 2000, 87 percent of community water systems complied with the requirement.

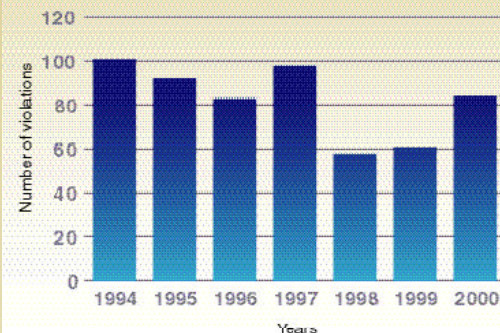
Consumer confidence reports for many Indiana communities are available at the U.S. EPA Office of Ground Water and Drinking Water.



[www.epa.gov/dwinfo/in.html](http://www.epa.gov/dwinfo/in.html)

### Drinking Water Health Standard Violations Community Public Water Supply Systems

Source: IDEM Office of Water Management, 2000

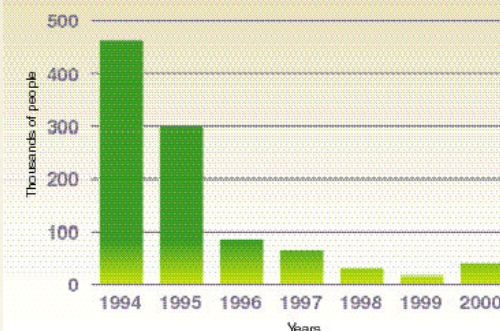


\*The year 2000 was a drought year for many facilities. This caused shifting soils to break drinking water lines which caused violations.

IDEM also began using a testing lab with a more sensitive Bac-T methodology.

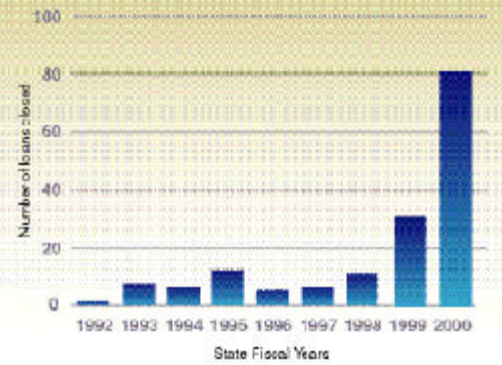
### Population Served by Systems in Significant Noncompliance

Source: IDEM Office of Water Management, 2000



## Total SRF Loans Closed

Source: IDEM Office of Water Management, 2000



## INDIANA' STATE REVOLVING FUND

The Wastewater State Revolving Fund and the Drinking Water State Revolving Fund are low-interest loan SRF programs created to assist Indiana communities with their wastewater and drinking water infrastructure improvement needs. Cities, towns, counties, conservancy districts and water authorities are eligible for this program.

Since the SRF program inception, the state has loaned over \$850 million to more than 186 communities throughout the state of Indiana. The drinking water program, which has made 40 loans for over \$118 million, ranks fifth in the nation in terms of the total dollar amount loaned to communities. The Wastewater SRF program has made over 146 loans for more than \$733 million.

Among the projects funded with SRF dollars, loans have enabled communities to improve wastewater and drinking water treatment plants, eliminate failing septic systems, extend sewer and water lines to homes previously not served, correct combined sewer overflow problems, and build water towers. These projects have helped to eliminate existing environmental pollution problems and protect public health.

## HAVE YOU SEEN THIS SIGN?

When traveling Indiana's roads you may notice signs indicating a "Drinking Water Protection Area." These signs are posted to let you know that you are in or near a drinking water source area called a "wellhead protection area."

A wellhead protection area is identified by a community public water supply as the surface and subsurface area which contributes water to that public water supply's production well or wellfield. Contaminants spilled or otherwise applied to the ground surface in a wellhead protection area could infiltrate to the ground water underneath. If this happens, then the ground water used as drinking water for a community is contaminated. Because it is difficult and costly to clean up contaminated ground water, community public water suppliers are working to develop plans to provide wellhead protection.

First, potential sources of contamination in the area are identified. These sources include anything that could cause contamination of the ground or ground water. Examples include landfills, underground storage tanks, septic systems, golf courses that apply fertilizers and any place where hazardous chemicals are handled or stored. The next step is to develop a plan to manage these sources. The plan will include an education and outreach program. One excellent tool for raising awareness of wellhead protection areas is to post signs along the roads that run through or near them. These signs let people know that they are in or near a drinking water protection area.



## GROUND WATER

Ground water is the water found below the surface where holes, cracks and spaces between rocks and soil are filled with water. Thirty-four percent of the population served by public drinking water systems depend on ground water. In addition to public water systems, more than 500,000 Indiana homes use private wells and ground water systems for their water supply.

Ground water also supports Indiana's economy as a source of water for industrial and agricultural uses. In 1998, Indiana used approximately 250 billion gallons of ground water, 10 percent more than in 1986.

## GROUND WATER HIGHLY SUSCEPTIBLE TO CONTAMINATION

Once contaminated, ground water is difficult to clean, requiring many years and great expense. Protecting ground water from possible pollution sources makes more sense.

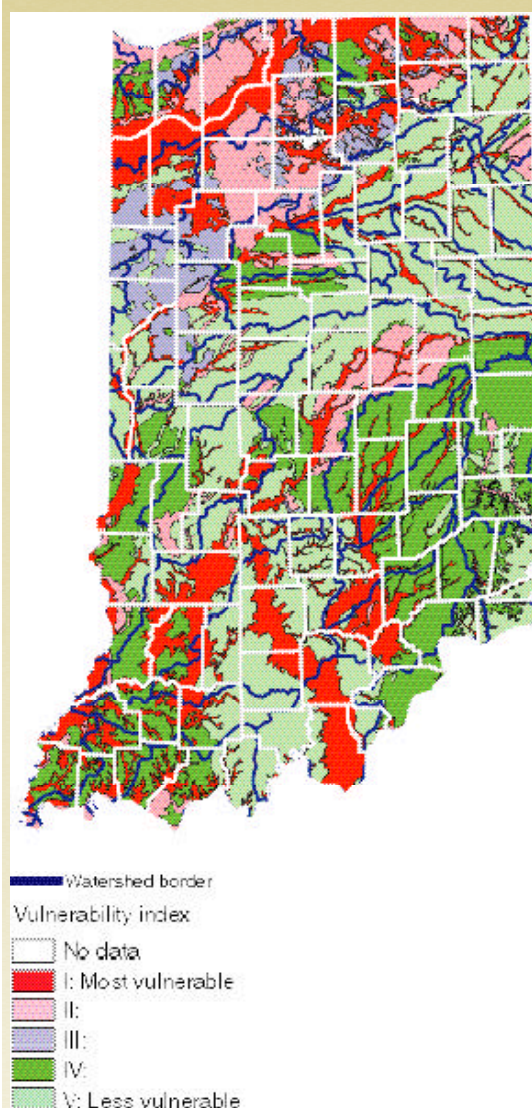
Some ground water is more susceptible to contamination because of the kind of soils and rocks above it. In some cases, the ground water is so close to the surface that pollutants do not have far to travel. In other cases, soils above the ground water are porous and pollutants can move quickly. Additionally, the poorly drained soils found in much of Indiana make it difficult for septic systems to perform well, which may result in ground water contamination.

Ground water vulnerability indices, such as the map on this page, are valuable tools in source-water assessments for community public water supply systems. Ground water vulnerability indices help define the relationship between geology and ground water. They also provide a better understanding of the flow system between ground and water.



## Ground Water Vulnerability Based On Geological Conditions\*

Source: Indiana Geological Survey, 1998

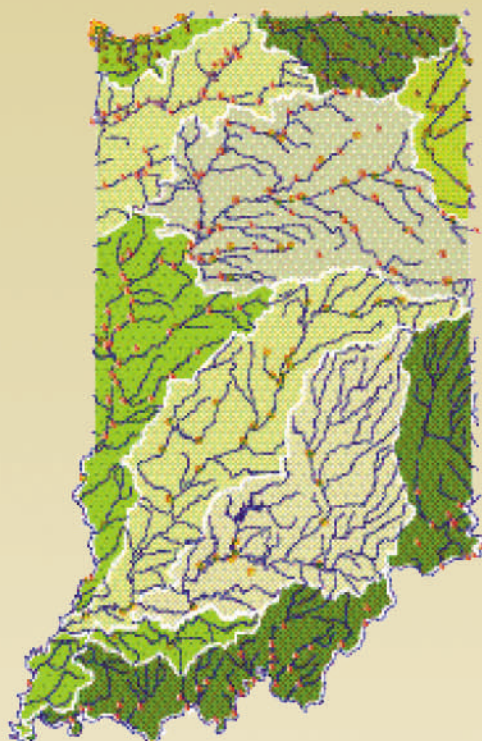


\*This map is a work in progress of IDEM and the Indiana Geological Survey.



## E.coli Monitoring Program

Source: Office of Water Quality, 2000



▲ 2000 Mobile Laboratory Survey and Kankakee TMDL Survey

▲ 1999-2000 USGS Recreational Site Survey

● 1997 and 1999 Fixed Station

— Streams and Rivers

## ASSESSING SURFACE WATER FOR RECREATIONAL USE

*E. coli* is the bacteriological indicator used in evaluating water quality for recreational uses.

Wastewater treatment plants have long been required to disinfect their effluents to achieve Recreational Water Quality Standards. Evaluation of the non-point sources of *E. coli* bacteria has been a challenge due to the necessity of testing within six hours of collection.

In 1998, 1999 and 2000, the Indiana Division of the United States Geological Survey (Dept. of the Interior) entered into a co-operative program with IDEM to collect and test for *E. coli* in the field using a mobile laboratory within a targeted watershed.

In 2000, IDEM placed a mobile laboratory into operation as the most practical method for determining the recreational standard in surface water. A mobile unit (van) was outfitted with a power supply, cabinetry and all the necessary equipment to collect field data and samples, set-up, incubate and analyze the results of these tests. The use of the mobile laboratory to assess *E. coli* bacteria statewide in Indiana streams has proven itself efficient, reliable and economical. As more communities are faced with difficult decisions regarding failing septic systems and nonpoint source pollution, the laboratory will be called upon to quantify *E. coli* pollution in surface waters as part of the Total Maximum Daily Load (TMDL) process and investigation.

The program conducted three five-week surveys in the Great Lakes Basin during the 2000 field season. The first survey assessed 38 sample sites in six northeastern counties. The second survey assessed 25 sample sites in the Lake Michigan Basin. The third survey assessed 27 sample sites in five counties. A total of 707 samples, inclusive of all QA/QC tests, were analyzed and entered into the Water Quality Assessment Information Management System database during the surveys.

A full report titled, "Concentrations of Escherichia Coli in Surface Water in the Great Lakes Watersheds of Indiana, June –October 2000" will be completed later this year.

During the recreational season of 2001, the West Fork of the White River and the Patoka River Basins will be studied by using three times the manpower as used in 2000. Approximately 4000 tests are anticipated. The TMDL program plans to intensely survey 25 waterbodies listed as impaired for recreational use in 2001.



## WETLANDS

Wetlands are areas of land that are wet (saturated or flooded) for at least part of the year, have soils that formed under wet conditions and support vegetation that can live in wet or moist areas. Wetlands are important because they naturally perform many functions we value as a society. Wetlands, depending on their location, can provide habitat for fish and wildlife, flood protection, shoreline stabilization, groundwater recharge, water quality protection and recreation.

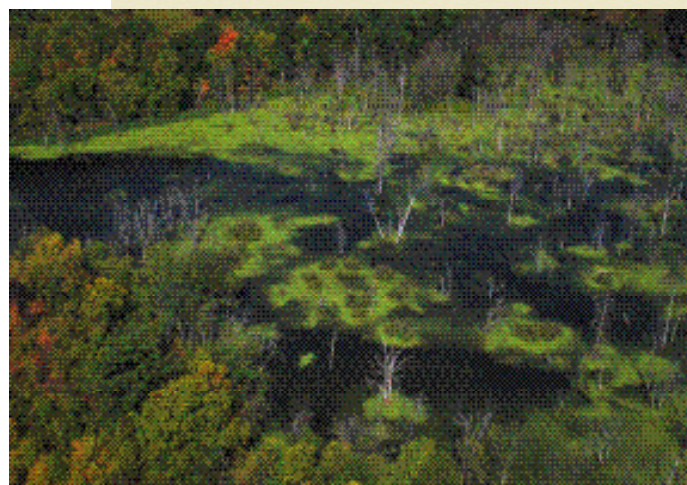
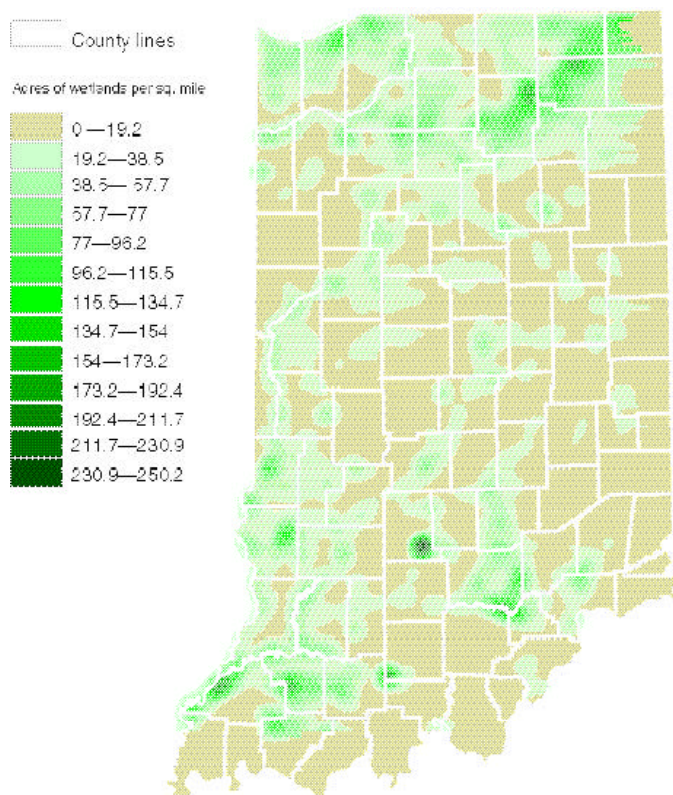
Nationally, 50 percent of the wetlands in the lower 48 states have been converted for other uses. Indiana has also converted a large number of its wetlands. Before we began converting wetlands in Indiana, there were over 5.6 million acres of wetlands in the state. In the 1700s, wetlands covered 25 percent of the total area of Indiana. By the late 1980s, over 4.7 million acres of wetlands had been lost - wetlands now cover less than 4 percent of Indiana. This means that more than 85 percent of our original wetlands have been drained or filled.



Guion Creek Elementary school students view a wetlands mitigation project teaming with fish, frogs and wetland plants.

### Indiana Wetlands

Source: Indiana Water Quality Report (Acres of Wetland by County), 1998; Indiana Wetland Compensatory Mitigation: Inventory, 2000.



A typical Indiana wetland.

## IDEM'S WETLANDS INITIATIVES

In recognition of the importance of wetlands, IDEM has undertaken numerous projects to increase our knowledge of Indiana's wetland resources and educate the public. For example, IDEM has recently completed the final phase of a three-year study to evaluate wetland mitigation. Mitigation is the creation of a wetland to counter the loss of wetland acreage and function due to new construction; it is a key component of IDEM's wetland regulatory program. This study evaluated 345 mitigation sites required over a ten-year period to identify potential problems and formulate solutions. This study is one of the largest ever conducted of wetland mitigation in the United States. With assistance from U.S. EPA, IDEM is completing a comprehensive outreach program designed to educate the public on wetland regulations and wetland conservation. This program features a series of brochures, a regulatory guidebook and two informational videos on

Indiana's wetland and the regulations that protect these resources. IDEM will be working with interested groups to hold seminars and meetings to distribute materials and increase awareness of Indiana's wetland resources.



## SURFACE WATER QUALITY

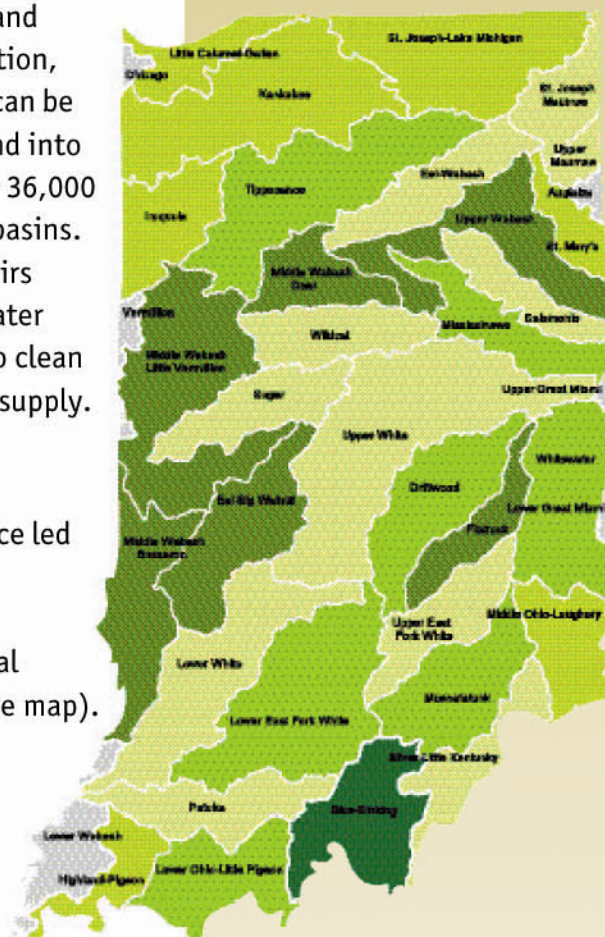
Focusing on watersheds allows environmental protection to move beyond political boundaries to more effectively understand and manage difficult issues. Such issues include sources of pollution, habitat destruction and drinking water protection. Indiana can be divided into 41 eight-digit watersheds, many of which extend into neighboring states. These watersheds contain approximately 36,000 stream miles and drain into the state's nine major drainage basins. Also, more than 600 publicly owned inland lakes and reservoirs cover more than 106,000 acres within the basins. Surface water quality varies greatly, from severely degraded by pollution to clean enough for fishing, swimming or for use as a drinking water supply.

## WATERSHED ASSESSMENT

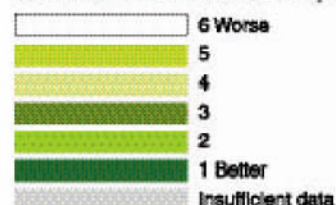
In 1998, IDEM and the Natural Resources Conservation Service led the first Unified Watershed Assessment (UWA) of Indiana watersheds. The results of this assessment identify Indiana watersheds that do not meet Clean Water Act or other natural resource goals. Watersheds are rated on a scale of 1 to 6 (see map).

### Indiana Watersheds

Source: IDEM Office of Water Management, 1999



#### Watershed assessment categories



## Watershed

A land area that drains into a lake or river and its tributaries.

## Basin

A large watershed or group of watersheds such as the Great Lakes and Ohio River basins.

For the purposes of the *2001 Annual State of the Environment Report*, basins within the state include groups of individual watersheds.





## GUIDE TO THE ASSESSMENT OF THE BASINS

Use this page as a general guide to the nine basin summaries that follow. The introduction on each page describes the basin's location and its main tributaries.

During spring, summer and fall (May through October), the Assessment Branch of the Office of Water Quality collects water samples, fish and aquatic macroinvertebrates specimens from selected rivers, streams and locations throughout Indiana. IDEM also measures the physical characteristics of stream channels. IDEM selects stream sampling locations using two independent techniques: computer-generated random selection (called probabilistic); and fixed-station selection using criteria such as land use and drainage, historic data and staff expertise.

Probabilistic selection allows information collected at one location, typically small streams and headwaters, to be generalized and applied to similar streams in the areas. This method is cost effective because small field crews are able to cover a larger area, it requires fewer samples and the information collected becomes available promptly. Water chemistry samples are collected once in spring, summer and fall. Biological communities are surveyed in summer only.

Probabilistic sampling designs provide information on the extent of impairment within a large geographic area. Previous sampling surveys did not provide the information needed to estimate how many stream miles are impaired. This new sampling program, combined with traditional sampling, provides an integrated approach to estimating the miles of impaired streams and determining why the streams are impaired.



## OVERALL BASIN QUALITY

### Aquatic life support

(% of total stream miles assessed for aquatic life support)



%

%



Provides suitable water quality for protection and reproduction of desirable aquatic life. Does not provide suitable water quality for protection and reproduction of desirable aquatic life.

### Recreational uses

(% of total stream miles assessed for recreational use)



%

%



People can swim in water without risk of adverse health effects, such as catching a waterborne disease from raw sewage contamination. People swimming in water risk adverse health effects, such as catching a waterborne disease from raw sewage contamination.

### Watersheds

		Aquatic life support		Recreational support	
Watershed	Stream miles	Percent Surveyed	 %	Percent Surveyed	 %
Name	#	%	%	%	%

**Note on Overall Basin Quality**—Overall basin quality is determined by using data from the Unified Water Assessment of Indiana Watersheds, the Surface Water Quality Monitoring Strategy and other data sources. As a result, overall basin quality ratings may differ from the individual watershed ratings based upon surveyed stream miles. Changes in basin quality ratings from prior reports are due, in most part, to improved analysis and increased data availability.

**Note on Aquatic Life Support**—Beginning with the 2000 Indiana Water Quality Report, surveyed watershed stream miles have been given an additional classification of partially supporting. Partially supporting water quality supports aquatic communities with fewer species of fish, plants and aquatic insects. For this report, watershed stream miles rated partially supporting have been combined with those rated non-supporting.



# MAJOR WASTEWATER FACILITIES

The following table shows the number of large facilities permitted to discharge to surface waters within the basin.

	ELECTRICAL	GOVERNMENT	INDUSTRIAL	MUNICIPAL
WHITE RIVER - EAST FORK _____	0	1	4	15
OHIO RIVER _____	6	1	5	16
WHITE RIVER - WEST FORK _____	6	0	3	23
KANKAKEE RIVER _____	1	0	2	5
MAUMEE RIVER _____	0	0	5	3
ST. JOSEPH RIVER _____	0	0	1	8
LAKE MICHIGAN _____	4	0	9	11
UPPER WABASH RIVER _____	4	1	4	18
LOWER WABASH RIVER _____	2	0	12	10

## Facilities Description

- Electrical**-Large power plants that generate electricity and require water for cooling.
- Government**-Major state or federally owned sites such as correctional facilities and military bases.
- Industrial**-Major industries with significant amounts of wastewater treatment discharge.
- Municipal**-Major wastewater treatment plants that discharge more than 1 million gallons per day.





## LAKE MICHIGAN BASIN

### Aquatic life support

(26% of total stream miles assessed for aquatic life support)



### Recreational uses

(25% of total stream miles assessed for recreational use)



#### WATERSHEDS

Watershed	Stream miles	Aquatic life support			Recreational support		
		Percent Surveyed			Percent Surveyed		
Lake Michigan*	43	100%	100%	0%	100%	0%	100%
L.Calumet-Galien	574	22%	34%	66%	22%	46%	54%
Chicago	40	10%	0%	100%	0%	Insufficient info.	

\*All 43 miles of Lake Michigan shoreline are partially supporting for recreation.



## ST. JOSEPH RIVER BASIN

### Aquatic life support

(7% of total stream miles assessed for aquatic life support)



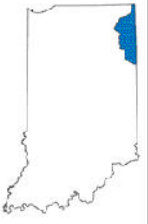
### Recreational uses

(7% of total stream miles assessed for recreational use)



#### WATERSHEDS

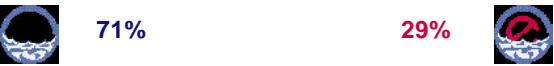
Watershed	Stream miles	Aquatic life support			Recreational support		
		Percent Surveyed			Percent Surveyed		
St. Joseph	1350	7%	86%	14%	7%	47%	53%



## MAUMEE RIVER BASIN

### Aquatic life support

(11% of total stream miles assessed for aquatic life support)



### Recreational uses

(11% of total stream miles assessed for recreational use)



#### WATERSHEDS

Watershed	Stream miles	Aquatic life support			Recreational support		
		Percent Surveyed			Percent Surveyed		
St. Joseph-Maumee	678	11%	84%	16%	11%	59%	41%
Upper Maumee	292	15%	100%	0%	15%	100%	0%
St. Mary's	337	11%	11%	89%	11%	100%	0%
Auglaize	117	0%	Insufficient info.		0%	Insufficient info.	



KANKAKEE RIVER BASIN

Aquatic life support

(3% of total stream miles assessed for aquatic life support)



Recreational uses

(3% of total stream miles assessed for recreational use)



WATERSHEDS

Watershed	Stream miles	Aquatic life support			Recreational support		
		Percent Surveyed			Percent Surveyed		
Kankakee	2646	3%	64%	36%	3%	44%	56%
Iroquois	857	<1%	100%	0%	0%	Insufficient info.	



UPPER WABASH RIVER BASIN

Aquatic life support\*

(100% of total stream miles assessed for aquatic life support)



Recreational uses

(18% of total stream miles assessed for recreational use)



WATERSHEDS

Watershed	Stream miles	Aquatic life support			Recreational support		
		Percent Surveyed			Percent Surveyed		
Eel-Wabash**	747	22%	67%	33%	10%	0%	100%
Upper Wabash**	953	21%	53%	47%	7%	0%	100%
Salamonie**	364	21%	85%	15%	9%	0%	100%
Mississinewa**	496	25%	70%	30%	5%	0%	100%
Tippecanoe**	2162	19%	89%	11%	10%	16%	84%
M. Wabash-Deer**	618	24%	100%	0%	14%	0%	100%
Wildcat**	689	87%	82%	18%	85%	63%	37%

\*Overall Basin Quality based upon statistically designed sampling methodology.

\*\*Contains partially supporting waters for aquatic life.



LOWER WABASH RIVER BASIN

Aquatic life support

(23% of total stream miles assessed for aquatic life support)







Recreational uses

(4% of total stream miles assessed for recreational use)



WATERSHEDS

Watershed	Stream miles	Aquatic life support			Recreational support		
		Percent Surveyed			Percent Surveyed		
Sugar*	840	11%	100%	0%	0%	Insufficient info.	
Patoka**	657	100%	94%	6%	30%	100%	0%
Vermilion*	134	15%	100%	0%	0%	Insufficient info.	
Lower Wabash*	457	0%	Insufficient info.		0%	Insufficient info.	
Middle Wabash							
L. Vermilion*	2298	8%	56%	44%	0%	Insufficient info.	
Busseron*	795	13%	84%	16%	0%	Insufficient info.	

\*Overall Basin Quality based upon statistically designed sampling methodology.

\*\*Contains partially supporting waters for aquatic life.





## WHITE RIVER BASIN - WEST FORK

### Aquatic life support

(100% of total stream miles assessed for aquatic life support)



### Recreational uses

(77% of total stream miles assessed for recreational use)



### WATERSHEDS

Watershed	Stream miles	Percent Surveyed	Aquatic life support		Percent Surveyed	Recreational support	
Upper White*	1755	100%	68%	32%	83%	88%	12%
Eel-Big Walnut*	1132	100%	81%	19%	65%	54%	46%
Lower White*	794	100%	93%	7%	77%	86%	14%

\*Contains partially supporting waters for aquatic life.



## WHITE RIVER BASIN - EAST FORK

### Aquatic life support

(90% of total stream miles assessed for aquatic life support)



### Recreational uses

(48% of total stream miles assessed for recreational use)



### WATERSHEDS

Watershed	Stream miles	Percent Surveyed	Aquatic life support		% Surveyed	Recreational support	
Driftwood	836	91%	90%	10%	72%	47%	53%
Flatrock-Haw	458	100%	100%	0%	18%	60%	40%
Upper E. Fork White	679	100%	>99%	<1%	25%	52%	48%
Lower E. Fork White*	1545	88%	>99%	<1%	46%	78%	22%
Muscatatuck*	916	80%	>99%	<1%	60%	53%	47%

\*Contains partially supporting waters for aquatic life.



## OHIO RIVER BASIN

### Aquatic life support

(36% of total stream miles assessed for aquatic life support)



### Recreational uses

(11% of total stream miles assessed for recreational use)



### WATERSHEDS

Watershed	Stream miles	Percent Surveyed	Aquatic life support		Percent Surveyed	Recreational support	
Whitewater*	1132	100%	92%	8%	13%	97%	3%
Ohio River-Mainstem*	357	100%	76%	24%	100%	0%	100%
M. Ohio-Laughery*	719	0%	Insufficient info.		0%	Insufficient info.	
Silver-L. Kentucky*	549	0%	Insufficient info.		0%	Insufficient info.	
Blue-Sinking*	862	9%	100%	0%	0%	Insufficient info.	
Lower Ohio-L. Pigeon*	773	<1%	0%	100%	0%	Insufficient info.	
Highland-Pigeon*	389	11%	0%	100%	0%	Insufficient info.	

\*Contains partially supporting waters for aquatic life.



## FIXED STATION MONITORING PROGRAM

One element of IDEM's surface water quality monitoring strategy is the Fixed Station Monitoring Program. Under this program, IDEM scientists collect water samples and field analytical data every month from 160 "fixed stations" (sampling sites) at selected rivers, streams and lakes throughout the state. The scientists send their water samples to the Indiana State Department of Health laboratory for analysis.

### What are the samples tested for?

The Indiana State Department of Health analyzes the general chemistry of the water by testing for the presence of heavy metals (e.g., copper, lead and mercury); nutrients (e.g., phosphorus, nitrates and nitrites); organic compounds (e.g., pesticides); other substances such as cyanide and arsenic; and bacteria such as *E. coli*. Each fixed station sampling site is tested for various parameters. These analyses are done in accordance with standard testing methods set by the U.S. EPA and environmental rules established by the Indiana Water Pollution Control Board.

### What field data are collected?

Field analytical data are the first indicators of water quality. IDEM collects data on dissolved oxygen levels, pH, temperature, specific conductance and turbidity.

### Field Data:

Dissolved oxygen readings are commonly used to measure water quality and determine whether the water is able to support desirable aquatic life. The ideal dissolved oxygen levels for fish are between seven and nine mg/L. Most fish can't survive at levels below three mg/L for extended periods of time.

pH is a convenient method of expressing the acidity or alkalinity of a solution. Natural waters usually have a pH between 6.5 and 8.5, with 7.0 being neutral. Values less than 7.0 indicate acidity, and values greater than 7.0 are considered basic or alkaline.

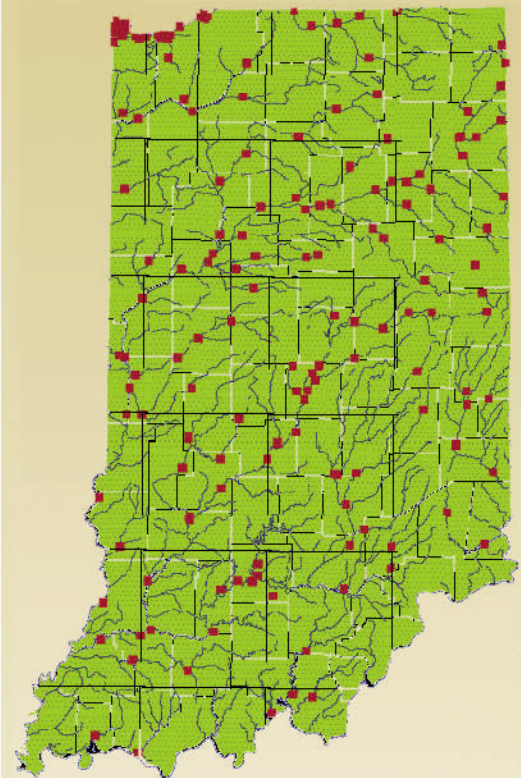
Temperature can adversely affect water quality and aquatic life. Aquatic organisms tend to be poorly adapted to rapid temperature changes and rising water temperatures can have devastating effects.

Specific conductance is related to the type and concentration of ions in solution. It can be used for approximating the total dissolved solids content of water by testing its capacity to carry an electrical current.

Turbidity is a measure of the cloudiness of water. The term "turbid" is applied to waters containing suspended matter that interferes with the passage of light through water or in which visual depth is restricted. Turbidity may be caused by a wide variety of suspended materials, such as clay, silt, finely divided organic and inorganic matter, plankton and other microscopic organisms. Turbidity in water has public health implications due to the possibilities of pathogenic bacteria. Turbidity also interferes with water treatment (filtration) and affects aquatic life.

## Fixed Monitoring Stations

Source: Office of Water Quality, 2000



160 Fixed stations

### What does IDEM do with the data?

IDEM uses the information:

- To determine background levels for certain types of potential pollutants,
- To develop wasteload allocations and permits for wastewater treatment plants,
- To plan for future restoration activities, and
- To provide data useful for preservation of streams.